

Abstract of the Disclosure:

In an epitaxial structure of a solid state lighting system, electrical current injection into the active layer is used to excite the photon emission. The present invention employs a unique waveguide layer in the epitaxial structure for trapping the light generated by the active layer in the fundamental waveguide mode. Multiple photonic crystal regions located either outside or inside one or more current injection regions extract photons from the waveguide layer(s). This novel design optimizes the interplay of electrical pumping, radiation and optical extraction to increase the optical output to several times that of conventional LEDs. A transparent and conductive ITO layer is added to the surface of an epitaxial structure to reduce the interface reflection in addition to functioning as a current spreading layer. The present invention creates solid state lighting with high optical output and high power efficiency.